UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P O Box 1450
Alexandria, Virginia 22313-1450
www uspto gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/567,710	02/07/2006	Shigeru Nishio	64846 (70904)	3885

21874 7590 05/29/2008
EDWARDS ANGELL PALMER & DODGE LLP
P.O. BOX 55874
BOSTON, MA 02205

EXAMINER	
WITKOWSKI, ALEXANDER C	

ART UNIT	PAPER NUMBER
2853	

MAIL DATE	DELIVERY MODE
05/29/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/567,710	NISHIO ET AL.	
	Examiner	Art Unit	
	ALEXANDER C. WITKOWSKI	2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 February 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 February 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *02/07/2006, 06/21/2006*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claim 1 - 10, 12, 15, 16, 19, 20, 22, and 23 rejected under 35 U.S.C. 103(a) as being unpatentable over Peeters et al. (US 6,340,216) in view of Lin et al. (US 6,328,393).

With respect to claim 1, Peeters et al. teaches an electrostatic suction type fluid discharge device (Fig.3: showing meniscus at ports 42 charged by electrode 54), in which drive voltage supply means supplies a drive voltage between a nozzle and a discharge target (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), so that the fluid is discharged from a hole of the nozzle to the discharge target (Fig.3: 42, 54), and

the drive voltage supply means outputting, as the drive voltage, a bipolar pulse voltage which alternates between positive and negative and has a frequency of not less than 1Hz (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage

driving material [fluid] 282 to electrode 54, and having a frequency twice droplet transit time; see also col.20, Table 2: disclosing AC drive frequency at 2 kHz).

However, Peeters et al. does not teach the hole of the nozzle falling within a range between φ0.01 μm and φ25 μm in diameter.

Lin et al. teaches the hole of the nozzle falling within a range between φ0.01 μm and φ25 μm in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm).

It would have been obvious to one of ordinary skill in the art at the time that this invention was made to modify Peeters et al. to provide teaches the hole of the nozzle falling within a range between φ0.01 μm and φ25 μm in diameter, as taught by Lin et al., to produce ink droplets of relatively small diameter in order to accommodate the demand for higher resolution printers.

With respect to claim 2, the combination of Peeters et al. and Lin et al. references teaches an electrostatic suction type fluid discharge device (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54), in which drive voltage supply means supplies a drive voltage between a nozzle and a discharge target (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), so that the fluid is discharged from a hole of the nozzle to the discharge target (Fig.3: 42, 54),

the hole of the nozzle falling within a range between φ0.01 μm and φ25 μm in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), and

the drive voltage supply means outputting, as the drive voltage, a bipolar pulse voltage which alternates between positive and negative and satisfies $f \leq 1/(2\tau)$ where τ is a time constant determined by $\tau = \varepsilon / \sigma$, f is a drive voltage frequency (Hz), σ is an electric conductivity (S/m) of the discharge fluid, and ε is a relative permittivity of the discharge fluid (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54, and having a frequency twice droplet transit time [$f \leq 1/2\tau$]).

With respect to claim 3, the combination of Peeters et al. and Lin et al. references teaches an electrostatic suction type fluid discharge device (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54), in which drive voltage supply means supplies a drive voltage between a nozzle and a discharge target (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), so that the fluid is discharged from a hole of the nozzle to the discharge target (Fig.3: 42, 54), and the nozzle and the discharge target are moved in a relative manner by shifting means, in a direction orthogonal to a direction along which the nozzle and the discharge target oppose to each other (Fig.3: showing discharged fluid directed orthogonally to a direction along which the nozzle 42 and discharge target 54

oppose each other; see also col.17, lines 63-64: disclosing that propellant redirects discharged fluid droplet from meniscus is pulled into channel 46),

the hole of the nozzle falling within a range between φ0.01 μm and φ25 μm in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm),

the drive voltage supply means outputting, as the drive voltage, a bipolar pulse voltage which alternates between positive and negative and has a frequency of fHz (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54, and having frequency twice droplet transit time [$f \leq 1/2\tau$]), and

the electrostatic suction type fluid discharge device further comprising control means that controls at least one of the drive voltage supply means and the shifting means (Peeters et al.: Fig.1: showing control of propellant [fluid] 14 ejector 12 by drive voltage) in such a manner as to satisfy $f \geq 5v$ where f is a drive voltage frequency (Hz) of the drive voltage supply means and v indicates a relative speed (μm / sec) of the relative movement of the nozzle and the discharge target (choice of design to avoid gaps in printing).

With respect to claim 4, the combination of Peeters et al. and Lin et al. references teaches an electrostatic suction type fluid discharge device (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54), in which drive voltage supply means supplies a drive voltage between a nozzle and a discharge target (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode

54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), so that the fluid is discharged from a hole of the nozzle to the discharge target (Fig.3: 42, 54), and the nozzle and the discharge target are moved in a relative manner by shifting means, in a direction orthogonal to a direction along which the nozzle and the discharge target oppose to each other (Fig.3: showing discharged fluid directed orthogonally to a direction along which the nozzle 42 and discharge target 54 oppose each other; see also col.17, lines 63-64: disclosing that propellant redirects discharged fluid droplet from meniscus is pulled into channel 46),

the hole of the nozzle falling within a range between φ0.01 μm and φ25 μm in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), and

the drive voltage supply means outputting, as the drive voltage, a bipolar pulse voltage which alternates between positive and negative and is not more than 400V (Peeters et al.: col.20: Table 2: disclosing drive voltages in the range of 0 to 500 volts).

With respect to claim 5, the combination of Peeters et al. and Lin et al. references teaches an electrostatic suction type fluid discharge method (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54), in which a drive voltage is supplied between a nozzle and a discharge target (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64:

disclosing that electrode 54 imparts proper charge to droplet from the meniscus), so that the fluid is discharged from a hole of the nozzle to the discharge target (Fig.3: 42, 54),

the hole of the nozzle falling within a range between φ0.01 μm and φ25 μm in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), and

the drive voltage being a bipolar pulse voltage which alternates between positive and negative and has a frequency of not less than 1Hz (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54, and having a frequency twice droplet transit time; see also col.20, Table 2: disclosing AC drive frequency at 2 kHz).

With respect to claim 6, the combination of Peeters et al. and Lin et al. references teaches an electrostatic suction type fluid discharge method (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54), in which a drive voltage is supplied between a nozzle and a discharge target (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), so that the fluid is discharged from a hole of the nozzle to the discharge target (Fig.3: 42, 54),

the hole of the nozzle falling within a range between φ0.01 μm and φ25 μm in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), and

the drive voltage being a bipolar pulse voltage which alternates between positive and negative and satisfies $f \leq 1/(2\tau)$ where τ is a time constant determined by $\tau = \varepsilon / \sigma$,

f is a drive voltage frequency (Hz), σ is an electric conductivity (S/m) of the discharge fluid, and ε is a relative permittivity of the discharge fluid (Peeters et al.: US 6,340,216: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54, and having frequency twice droplet transit time [$2f \leq 1/\tau$]).

With respect to claim 7, the combination of Peeters et al. and Lin et al. references teaches an electrostatic suction type fluid discharge method (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54), in which a drive voltage is supplied between a nozzle and a discharge target (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), so that the fluid is discharged from a hole of the nozzle to the discharge target (Fig.3: 42, 54), and the nozzle and the discharge target are moved in a relative manner, in a direction orthogonal to a direction along which the nozzle and the discharge target oppose to each other (Fig.3: showing discharged fluid directed orthogonally to a direction along which the nozzle 42 and discharge target 54 oppose each other; see also col.17, lines 63-64: disclosing that propellant redirects discharged fluid droplet from meniscus, which droplet is pulled into channel 46),

the hole of the nozzle falling within a range between φ0.01 μm and φ25 μm in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), as the drive voltage, a bipolar pulse voltage which alternates between positive and

negative and has a frequency of fHz being outputted, and at least one of the drive voltage frequency fHz and a relative speed vμm / sec of the relative movement of the nozzle and the discharge target being controlled in such a manner as to satisfy $f \geq 5v$ (choice of design to avoid gaps in printing).

With respect to claim 8, the combination of Peeters et al. and Lin et al. references teaches an electrostatic suction type fluid discharge method (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54), in which a drive voltage is supplied between a nozzle and a discharge target (Fig.3: showing meniscus at ports 42 charged by electrode 54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), so that the fluid is discharged from a hole of the nozzle to the discharge target (Fig.3: 42, 54),

the hole of the nozzle falling within a range between φ0.01 μm and φ25 μm in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), and

the drive voltage being a bipolar pulse voltage which alternates between positive and negative and is not more than 400V (Peeters et al.: col.20: Table 2: disclosing drive voltages in the range of 0 to 500 volts).

With respect to claim 9, the combination of Peeters et al. and Lin et al. references an electrostatic suction type fluid discharge device (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54) that (i) discharges, by

electrostatic suction, a discharge fluid through a fluid discharge hole of a nozzle of a fluid discharge head (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54), the discharge fluid being electrically charged by voltage application (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), and (ii) causes the discharge fluid to land onto a substrate (col.24, lines 31-35), (iii) so as to form a drawing pattern by the discharge fluid on a surface of the substrate (col.9, lines 63-66: disclosing preformed electrodes 314 in rectangular, annular, or other shape in plan form),

the fluid discharge hole of the nozzle falling in a range between φ0.01μm and φ25μm in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), and

the substrate being insulating (Peeters et al.: Fig 40E; col.9, line 63 to col.10, line 9: disclosing dielectric layer 316 to protect electrode 314),

the electrostatic suction type fluid discharge device comprising:

charge removal means for removing an electric charge on the surface of the substrate, before the discharge fluid is discharged onto the substrate (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54; note that substrate charge is zero when bipolar drive voltage is zero before each fluid discharge); and

fluid discharge means for discharging, by a positive and negative bipolar pulse voltage, the discharge fluid onto the substrate from which electricity has been removed

(Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54).

With respect to claim 10, the combination of Peeters et al. and Lin et al. references teaches the electrostatic suction type fluid discharge device as defined in claim 9, wherein, the charge removal means removes the electricity on the substrate, in line with a predetermined pattern (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54).

With respect to claim 12, the combination of Peeters et al. and Lin et al. references teaches the electrostatic suction type fluid discharge device as defined in claim 11, wherein, the voltage applied when the fluid discharge means discharges the discharge fluid is not less than 340V (Peeters et al.: col.20: Table 2: disclosing drive voltages to 500 volts).

With respect to claim 15, the combination of Peeters et al. and Lin et al. references teaches an electrostatic suction type fluid discharge method (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54) in which (i) by electrostatic suction, a discharge fluid is discharged through a fluid discharge hole of a nozzle of a fluid discharge head, the discharge fluid being electrically charged by voltage application (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), and (ii) the discharge fluid is caused to land onto

a substrate (col.24, lines 31-35), (iii) so that a drawing pattern is formed by the discharge fluid on a surface of the substrate (col.9, lines 63-66: disclosing preformed electrodes 314 in rectangular, annular, or other shape in plan form),

the fluid discharge hole of the nozzle falling in a range between φ0.01 μm and φ25 μm in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), and

the substrate being insulating (Peeters et al.: Fig 40E; col.9, line 63 to col.10, line 9: disclosing dielectric layer 316 to protect electrode 314),

an electric charge on the surface of the substrate being removed, before the discharge fluid is discharged onto the substrate (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54; note that substrate charge is zero when bipolar drive voltage is zero before each fluid discharge), and

by a positive and negative bipolar pulse voltage, the discharge fluid being discharged onto the substrate from which electricity has been removed (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54).

With respect to claim 16, the combination of Peeters et al. and Lin et al. references teaches an electrostatic suction type fluid discharge device (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54) that (i) discharges, by electrostatic suction, a discharge fluid through a fluid discharge hole of a nozzle of a

fluid discharge head (Fig.3: 42, 54), the discharge fluid being electrically charged by voltage application (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), and (ii) causes the discharge fluid to land onto a substrate (col.24, lines 31-35), (iii) so as to form a drawing pattern by the discharge fluid on a surface of the substrate (Fig 40E; col.9, line 63 to col.10, line 9: disclosing dielectric layer 316 to protect electrode 314),

the fluid discharge hole of the nozzle falling in a range between φ0.01 μm and φ25 μm in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), and

the substrate being insulating (Peeters et al.: Fig 40F; col.9, line 63 to col.10, line 9: disclosing dielectric layer 316 to protect electrode 314),

the electrostatic suction type fluid discharge device comprising:

electric charge providing means for providing an electric charge to a surface of the substrate, in line with a predetermined pattern (Peeters et al.: col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54; see also col.9, lines 63-66: disclosing preformed electrodes 314 in rectangular, annular, or other shape in plan form).

With respect to claim 19, the combination of Peeters et al. and Lin et al. references teaches a plot formation method using an electrostatic suction type fluid discharge device (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54) that (i) discharges, by electrostatic suction, a discharge fluid through a

fluid discharge hole of a nozzle of a fluid discharge head, the discharge fluid being electrically charged by voltage application, and (ii) causes the discharge fluid to land onto a substrate (col.24, lines 31-35), (iii) so as to form a drawing pattern by the discharge fluid on a surface of the substrate (col.9, lines 63-66: disclosing preformed electrodes 314 in rectangular, annular, or other shape in plan form),

the fluid discharge hole of the nozzle falling in a range between φ0.01 μm and φ25 μm in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm),

the substrate being insulating (Peeters et al.: Fig 40E; col.9, line 63 to col.10, line 9: disclosing dielectric layer 316 to protect electrode 314),

before the discharge fluid is discharged, an electric charge, whose polarity is in reverse to a polarity of a drive voltage by which the discharge fluid is electrically charged in advance, being applied to a part of the insulating substrate where a drawing pattern is to be formed, so that an electric charge pattern is formed (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54), so that an electric charge pattern is formed (col.9, lines 63-66: disclosing preformed electrodes 314 in rectangular, annular, or other shape in plan form), and

the drawing pattern being formed by the discharge fluid, by discharging the discharge fluid on the electric charge pattern (col.9, lines 63-66: disclosing preformed electrodes 314 in rectangular, annular, or other shape in plan form).

With respect to claim 20, the combination of Peeters et al. and Lin et al. references teaches a plot formation method using an electrostatic suction type fluid discharge device (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54) that (i) discharges, by electrostatic suction, a discharge fluid through a fluid discharge hole of a nozzle of a fluid discharge head (Fig.3: 42, 54), the discharge fluid being electrically charged by voltage application (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), and (ii) causes the discharge fluid to land onto a substrate (col.24, lines 31-35), (iii) so as to form a drawing pattern by the discharge fluid on a surface of the substrate (col.9, lines 63-66: disclosing preformed electrodes 314 in rectangular, annular, or other shape in plan form),

the fluid discharge hole of the nozzle falling in a range between φ0.01 μm and φ25 μm in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm),

the substrate being insulating (Peeters et al.: Fig 40E; col.9, line 63 to col.10, line 9: disclosing dielectric layer 316 to protect electrode 314),

before the fluid is discharged, an electric charge, whose polarity is identical with a polarity of a drive voltage by which the discharge fluid is electrically charged in advance (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54), being applied around a part on the insulating substrate where a drawing pattern is to be formed (col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54), so that an electric charge pattern is formed (col.9, lines 63-66:

disclosing preformed electrodes 314 in rectangular, annular, or other shape in plan form), and

the drawing pattern being formed by the discharge fluid, by discharging the discharge fluid onto a drawing pattern formation area which is surrounded by the electric charge pattern (Peeters et al.: col.9, lines 63-66).

With respect to claim 22, the combination of Peeters et al. and Lin et al. references teaches a plot formation method using an electrostatic suction type fluid discharge device (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54) that (i) discharges, by electrostatic suction, a discharge fluid through a fluid discharge hole of a nozzle of a fluid discharge head , the discharge fluid being electrically charged by voltage application (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), and (ii) causes the discharge fluid to land onto a substrate (col.24, lines 31-35), (iii) so as to form a drawing pattern by the discharge fluid on a surface of the substrate (col.9, lines 63-66: disclosing preformed electrodes 314 in rectangular, annular, or other shape in plan form),

the fluid discharge hole of the nozzle falling in a range between $\varphi 0.01\mu m$ and $\varphi 25\mu m$ in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm),

the substrate being insulating (Peeters et al.: Fig.40E; col.9, line 63 to col.10, line 9: disclosing dielectric layer 316 to protect electrode 314),

before the discharge fluid is discharged, an electric charge, whose polarity is identical with a polarity of a drive voltage by which the discharge fluid is electrically charged in advance (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54; note that substrate charge is zero when bipolar drive voltage is zero before each fluid discharge), being applied to a non-image-drawing area where a drawing pattern is not to be formed on the insulating substrate, so that an electric charge pattern is formed (col.9, lines 63-66: disclosing preformed electrodes 314 in rectangular, annular, or other shape in plan form), and

the drawing pattern being formed while the voltage applied for discharging the discharge fluid is not stopped even on the non-image drawing area (Peeters et al.: col.9, lines 63-66).

With respect to claim 23, the combination of Peeters et al. and Lin et al. references teaches a plot formation method using an electrostatic suction type fluid discharge device (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54) that (i) discharges, by electrostatic suction, a discharge fluid through a fluid discharge hole of a nozzle of a fluid discharge head (Fig.3: 42, 54) , the discharge fluid being electrically charged by voltage application (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), and (ii) causes the discharge fluid to land onto a substrate (col.24, lines 31-35) (iii) so as to form a drawing pattern by the discharge fluid on a surface of the substrate (col.9, lines 63-66: disclosing preformed electrodes 314 in rectangular, annular, or other shape in plan form),

the fluid discharge hole of the nozzle falling in a range between φ0.01 μm and φ25 μm in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm),

the substrate being insulating (Peeters et al.: Fig 40E; col.9, line 63 to col.10, line 9: disclosing dielectric layer 316 to protect electrode 314), and

in a case where a first drawing pattern made of a conductive material has been formed by a conductive material on the insulating substrate (Peeters et al.: col.9, lines 63-66: disclosing preformed electrodes 314 in rectangular, annular, or other shape in plan form) and a second drawing pattern is further formed on the first drawing pattern (col.9, lines 63-66), the second drawing pattern being formed while a voltage is applied to the conductive part by which the first drawing pattern is made (col.24, lines 31-35).

2. Claims 11, 13, 14, 17, 18, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peeters et al. (US 6,340,216) in view of Lin et al. (US 6,328,393), and further in view of Ohno et al. (US 6,096,468).

With respect to claim 11, the combination of Peeters et al. and Lin et al. references teaches the electrostatic suction type fluid discharge device as defined in claim 9, wherein, the fluid discharge means discharges the discharge fluid by applying a voltage which is arranged such that an electric field strength generated by electric charge concentration at a meniscus part (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54).

However, the combination of Peeters et al. and Lin et al. references does not teach that the electric field strength, when discharging the discharge fluid, is smaller than a discharge start electric field strength figured out by an equation for calculating Paschen curve.

Ohno et al. teaches that the electric field strength, when discharging the discharge fluid, is smaller than a discharge start electric field strength figured out by an equation for calculating Paschen curve (Ohno et al.: col.40, lines 43-50: disclosing need for field strength to be smaller than that calculated by Paschen curve).

It would have been obvious to one of ordinary skill in the art at the time that this invention was made to modify the combination of Peeters et al. and Lin et al. references such that the electric field strength, when discharging the discharge fluid, is smaller than a discharge start electric field strength figured out by an equation for calculating Paschen curve, as taught by Ohno et al., for the purpose of avoiding attraction and adhesion of the toner to the charging member, which would deteriorate the toner (Ohno et al.: col.40, lines 43-50).

With respect to claim 13, the combination of Peeters et al. and Lin et al. references teaches the electrostatic suction type fluid discharge device as defined in claim 11, wherein, the fluid discharge hole of the nozzle is not less than 16 μm or not more than 0.25 μm in diameter (Lin et al.: col.2, lines 27-32: disclosing nozzle diameters of 10 to 80 μm), and the voltage applied when the fluid discharge means discharges the

discharge fluid is not more than 500V (Peeters et al.: col.20: Table 2: disclosing drive voltages in the range of 0 to 500 volts).

With respect to claim 14, the combination of Peeters et al. and Lin et al. references teaches the electrostatic suction type fluid discharge device as defined in claim 11, wherein, the fluid discharge hole of the nozzle is not less than 7.4 μm or not more than 0.65 μm in diameter (Lin et al.: col.2, lines 27-32: disclosing nozzle diameters of 10 to 80 μm), and the voltage applied when the fluid discharge means discharges the discharge fluid is not more than 400V (Peeters et al.: col.20: Table 2: disclosing drive voltages in the range of 0 to 500 volts).

With respect to claim 17, the combination of Peeters et al. and Lin et al. references teaches all the limitations of its parent claim 16, except the electrostatic suction type fluid discharge device, wherein, the electric charge providing means provides the electric charge to an insulating substrate made of a photoconductive material, the electric charge providing means including: uniform electric charging means for uniformly charging the surface of the insulating substrate; and charge removal means for applying, in line with a predetermined pattern, a laser beam to the surface being uniformly charged, so as to remove electricity from a part of the surface where the laser beam has been applied.

However, Ohno et al. teaches the electric charge providing means provides the electric charge to an insulating substrate made of a photoconductive material (Ohno et

al.: col.1, lines 19-22: disclosing electrostatic latent image [pattern] on a photosensitive member [insulating substrate] 56 by utilizing a photoconductive material; see also col.36, lines 48-51: disclosing electrostatic charging of photosensitive member before exposure to laser forms a latent image), the electric charge providing means including: uniform electric charging means for uniformly charging the surface of the insulating substrate (col.36, lines 48-51); and charge removal means for applying, in line with a predetermined pattern, a laser beam to the surface being uniformly charged, so as to remove electricity from a part of the surface where the laser beam has been applied (col.36, lines 48-51: disclosing use of laser to form latent image [predetermined pattern] on electrically charged surface by reversal imaging [no toner where laser beam has been applied]).

It would have been obvious to one of ordinary skill in the art at the time that this invention was made to modify the combination of Peeters et al. and Lin et al. references to provide the electrostatic suction type fluid discharge device, wherein, the electric charge providing means provides the electric charge to an insulating substrate made of a photoconductive material, the electric charge providing means including: uniform electric charging means for uniformly charging the surface of the insulating substrate; and charge removal means for applying, in line with a predetermined pattern, a laser beam to the surface being uniformly charged, so as to remove electricity from a part of the surface where the laser beam has been applied, as taught by Ohno et al., for the purpose of adapting xerographic imaging to development of latent images using fluidized toner.

With respect to claim 18, the combination of Peeters et al., Lin et al., and Ohno et al. references teaches an electrostatic suction type fluid discharge device (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54) that (i) discharges, by electrostatic suction, a discharge fluid through a fluid discharge hole of a nozzle of a fluid discharge head (Fig.3: 42, 54), the discharge fluid being electrically charged by voltage application (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), and (ii) causes the discharge fluid to land onto a substrate (col.24, lines 31-35), (iii) so as to form a drawing pattern by the discharge fluid on a surface of the substrate (col.9, lines 63-66: disclosing preformed electrodes 314 in rectangular, annular, or other shape in plan form),

the fluid discharge hole of the nozzle falling in a range between φ0.01 μm and φ25 μm in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), the substrate being insulating, and, the electrostatic suction type fluid discharge device comprising:

voltage application means that is capable of touching the insulating substrate on which a pattern of a conductive material is formed and that applies a voltage to a conductive part on the insulating substrate, when the electrostatic suction type fluid discharge device discharges the discharge fluid (Ohno et al.: Fig.7: showing charging roller [voltage application means] 51 that is capable of touching the photosensitive member [insulating substrate] 56 on which a pattern of a toner [conductive material] 50 is formed and that applies a voltage to a charging roller [conductive part] 51 on the

photosensitive member [insulating substrate], when the electrostatic suction type fluid discharge device discharges the toner [discharge fluid] 50; see also col. 36, lines 12-24: disclosing dielectric coating on [touching] conductive surface).

With respect to claim 21, the combination of Peeters et al., Lin et al., and Ohno et al. references teaches the plot pattern formation method as defined in claim 20, wherein, the electric charge pattern is formed in such a manner that, after a surface of the insulating substrate is electrically charged in a uniform manner (Ohno et al.: col.1, lines 19-22: disclosing electrostatic latent image [pattern] on a photosensitive member [insulating substrate] 56 by utilizing a photoconductive material; see also col.36, lines 48-51: disclosing electrostatic charging of photosensitive member before exposure to laser forms a latent image), a laser beam is applied to the uniformly-charged surface in line with a predetermined pattern, and electricity is removed from a part where the laser beam has been applied (col.36, lines 48-51: disclosing use of laser to form latent image [predetermined pattern] on electrically charged surface).

Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kohyama et al. (US 6,126,274) discusses liquid dispersion of toner.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEXANDER C. WITKOWSKI whose telephone number

is (571)270-3795. The examiner can normally be reached on Monday - Friday 8:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen D. Meier can be reached on 571-272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ACW

/STEPHEN D. MEIER/
Supervisory Patent Examiner, Art Unit 2853